

MASTER OF SCIENCE IN APPLIED MATHEMATICS

GAUGE INTEGRATION

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It is generally accepted that the Riemann integral is more useful as a pedagogical device for introductory analysis than for advanced mathematics. This is simply because there are many meaningful functions that are not Riemann integrable, and the theory of Riemann integration does not contain sufficiently strong convergence theorems. Lebesgue developed his theory of measure and integration to address these shortcomings. His integral is more powerful in the sense that it integrates more functions and possesses more general convergence theorems. However, his techniques are significantly more complicated and require a considerable foundation in measure theory. There is now an impetus to accept the gauge integral as a possible new standard in mathematics. This relatively recent integral possesses the intuitive description of the Riemann integral, with the power of the Lebesgue integral. The purpose of this thesis is to explore the basis of gauge integration theory through its associated preliminary convergence theorems, and to contrast it with other integration techniques through explicit examples.

KEYWORDS: Gauge Integration, Kurzweil, Henstock, HK-Integral, Generalized Riemann

